

NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

JPRS: 19,285

OTS: 63-21866

20 May 1963

AD No. 406967

DDC FILE COPY

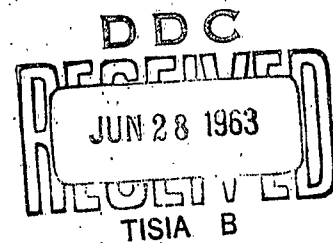
SPECTRAL STUDY OF THE LUMINESCENCE OF THE TISSUES
OF THE OTORHINOLARYNGOLOGICAL ORGANS

by Yu. N. Yefuni, et al.

- USSR -

406 967

Scale - 3



U. S. DEPARTMENT OF COMMERCE

OFFICE OF TECHNICAL SERVICES

JOINT PUBLICATIONS RESEARCH SERVICE

Building T-30

Ohio Drive and Independence Avenue, S.W.
Washington 25, D. C.

Price: \$.50

FOREWORD

This publication was prepared under contract for the Joint Publications Research Service as a translation or foreign-language research service to the various federal governments.

The contents of this material in no way represent the policies, views or attitudes of the U. S. Government or of the parties to any distribution arrangement.

PROCUREMENT OF JPRS REPORTS

All JPRS reports may be ordered from the Office of Technical Services. Reports published prior to 1 February 1963 can be provided, for the most part, only in photocopy (xerox). Those published after 1 February 1963 will be provided in printed form.

Details on special subscription arrangements for JPRS social science reports will be provided upon request.

No cumulative subject index or catalog of all JPRS reports has been compiled.

All JPRS reports are listed in the Monthly Catalog of U. S. Government Publications, available on subscription at \$4.50 per year (\$6.00 foreign), including an annual index, from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

All JPRS scientific and technical reports are cataloged and subject-indexed in Technical Translations, published semimonthly by the Office of Technical Services, and also available on subscription (\$12.00 per year domestic, \$16.00 foreign) from the Superintendent of Documents. Semiannual indexes to Technical Translations are available at additional cost.

SPECTRAL STUDY OF THE LUMINESCENCE OF THE TISSUES
OF THE OTORHINOLARYNGOLOGICAL ORGANS

USSR

[Following is a translation of an article by Yu. N. Yefuni and A. V. Karyakin, State Scientific Research Institute of Ear, Nose, and Throat of the MZ RSFSR, Moscow Order of Lenin Clinical Hospital imeni S. P. Botkin, in the Russian-language journal Biophysika (Biophysics), Vol VII, No 4, Moscow, 1962, pages 480-483.]

As is known (1-7), tumor tissue of the stomach, rectum, breast and lungs possesses fluorescence upon the introduction of dye into the human or animal organism. This property aids in the diagnosis of malignant tumors and helps to define more precisely their limits, which is very important for the postoperative prognosis. On the basis of studies of the luminescence of different tissues of the ear, nose and throat, it has been shown (8), that upon injection into the organism of fluorescein, certain pathologically involved tissues of these organs possess a characteristic yellowish green luminescence which is characteristic of the injected dye upon exposure to filtered ultraviolet light. Such tissues include nasal polyps in which there is edema and fibrous tissue and certain non-epithelial tumors such as reticulosarcoma, reticulosis, the Shmink tumor, angioendothelioma, and juvenile fibroma of the nasopharynx.

As to tumors localized in the ear, nose and throat (squamous-cell keratinizing and nonkeratinizing tumors, adenocarcinoma and epidermoid carcinoma, as well as the so-called Shneyderov form), as well as papillomatosis, fibroma and angioma, upon examination in filtered ultraviolet light, following the injection into the organism of fluorescein, in no case was luminescence of the tumor observed. At the same time, preparations of these tumors in filtered ultraviolet light produced a secondary luminescence in certain cases.

From the objective conformation of the data of visual observations of fluorescence in pathologic tissues received in the clinic, we used in the present work a spectrophotometric method which has been used for the study of the luminescence of lung tissue (2).

We obtained the tissues which we studied from the surgical department. Spectral studies were performed on the luminescence of tissues removed from patients to whom had been given, prior to operation, technically pure fluorescein (8), or whose tissues had been subjected to ordinary laboratory staining (2) following their removal. In addition, spectral studies were also made of the luminescence of removed tissues in order to determine the level of natural, primary luminescence, without the addition of a fluorochrome.

In all, we performed spectrophotometric studies on more than 30 samples of tissues from the ear, nose and throat. The results of the studies (Figures 1-4) are shown in the table, in which are given the spectra of primary and secondary fluorescence of the tissues of the ear, nose and throat, and in which the relations are shown between the intensity in the maxima of the spectra of fluorescence of dye absorbed to the intensity of the maxima of primary, that is natural, fluorescence of a given tissue (see Columns 7 and 10 of the table).

A comparison of the visual observations of the luminescence of different tissues of the ear, nose and throat with the calculated ratio of intensities of maxima of secondary fluorescence to primary fluorescence, enable us to demonstrate certain definite laws. The luminescence of the organic dye - technically pure fluorescein - in ear, nose and throat tissues upon examination of patients in filtered ultraviolet light is not observed in cases in which the ratio of intensity of the maxima of the luminescence has a value from 1.0-2.0. When the ratio of intensities of maxima of fluorescence is greater than 3, as occurs, for example, in nasal polyps, then examination of the ear, nose and throat, as well as of the slides of removed tissues, in filtered ultraviolet light shows a contrasting yellowish green luminescence.

As can be seen from the Table and from Figures 1-4, there is a complete identity of the spectra of secondary luminescence of tissues both in the case of intravital staining (that is, when the fluorescein is given to the patient before operation), and in cases of laboratory staining.

A careful analysis of the spectra of luminescence of tissues of the ear, nose and throat shows that unmodified tissue of these areas almost fails to absorb the fluorescein (Figure 1). The demonstration of a new maximum in the area of 510 m μ must be attributed to the luminescence of the dye, which is absorbed by the tissue in small amounts.

It should be noted that the tonsillar tissue in cases of chronic tonsillitis absorbs the fluorescein as poorly as does the natural tissue (Figure 2).

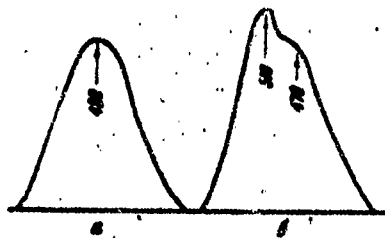


Figure 1. Spectrum of luminescence of unchanged tissue (true vocal cord).

- a - Primary luminescence;
- b - Secondary luminescence following laboratory staining

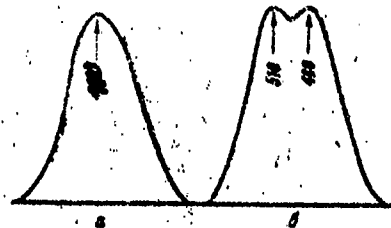


Figure 2. Spectrum of luminescence of the tonsil in a case of chronic tonsillitis.

- a - Primary luminescence;
- b - Secondary luminescence upon intravital staining

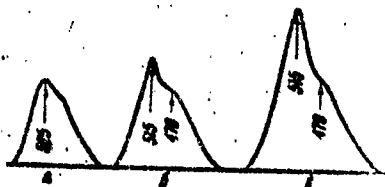


Figure 3. Spectrum of luminescence of tumor tissue.

- a - Primary luminescence;
- b - Luminescence upon laboratory staining;
- c - Secondary luminescence upon intravital staining

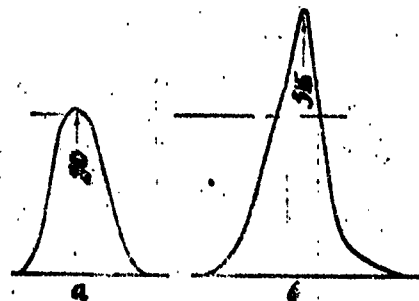


Figure 4. Spectrum of luminescence of fibrous and edematist polyp.

- a - Primary luminescence;
- b - Secondary luminescence upon intravital staining

№ п.п.	Первичная документация			Вторичная документация				
	① Исходные данные тканей и текстиль- ных изделий, характе- ристика их	② Исходные данные тканей и текстиль- ных изделий, характе- ристика их	③ Исходные данные тканей и текстиль- ных изделий, характе- ристика их	④ Исходные данные тканей и текстиль- ных изделий, характе- ристика их	⑤ Исходные данные тканей и текстиль- ных изделий, характе- ристика их	⑥ Исходные данные тканей и текстиль- ных изделий, характе- ристика их	⑦ Исходные данные тканей и текстиль- ных изделий, характе- ристика их	⑧ Исходные данные тканей и текстиль- ных изделий, характе- ристика их
1	① Неизмененная истинная голосовая связка	② Широкая полоса с плохо выражен- ным максимумом	③ 480—490	④ Широкая полоса с двумя максиму- мами	⑤ 510, 470	⑥ 1—1,4	⑦ Широкая полоса с двумя максиму- мами	⑧ 510, 470
2	② Небный мида- лик при хрониче- ском тонзиллите	③ Широкая полоса с плохо выражен- ным максимумом	④ 480	⑤ Широкая полоса с двумя максиму- мами	⑥ 510, 480	⑦ 1,0—1,3	⑧ Широкая полоса с двумя максиму- мами	⑨ 510, 480
3	③ Раковая ткань	④ Широкая полоса с плохо выражен- ным максимумом; имеет меньшую интенсивность, чем 1, 2 и 4 (по вертикали)	⑤ 500—515	⑥ Широкая полоса с двумя максиму- мами	⑦ 515, 470	⑧ 1,4	⑨ Широкая полоса с двумя максиму- мами	⑩ 515, 470
4	④ Отлично-фиброз- ный полип носа	⑤ Широкая полоса с плохо выражен- ным максимумом	⑥ 470—480	⑦ Узкая полоса	⑧ 515	⑨ 3,6	⑩ Узкая полоса	⑪ 515

Key to Table on page 4

1. Number of patient;
2. Primary luminescence;
3. Type of tissue and histologic characteristics of it;
4. Type of spectrum;
5. Maximum in m μ c;
6. Secondary luminescence;
7. Upon laboratory staining;
8. Type of spectrum upon laboratory staining;
9. Ratio of intensities of maxima of fluorescence of the dye to maxima of primary fluorescence of tissues;
10. Upon intravital staining;
11. Type of spectrum upon staining tissues intravitaly;
12. Unmodified true vocal cord;
13. Wide band with poorly demonstrated maximum;
14. Wide band with two maxima;
15. Tonsil in chronic tonsillitis;
16. Tumor tissue;
17. Wide band with poorly demonstrated maximums; has less intensity than 1, 2 and 4 (with respect to its vertical dimension);
18. Edematofibrous polyp of the nose;
19. Narrow band of high intensity with a single maximum due to the dye.

Tumor tissue absorbs fluorescein poorly, but nonetheless slightly better than normal tissue, especially with intravital staining (Figure 3). The spectra of cancer tissue show a basic maximum at 515 m μ c and a secondary maximum at 470 m μ c, which is attributable to primary luminescence.

Nasal polyps, as compared with the above mentioned tissues, absorb fluorescein very readily (Figure 4). The spectrum of a polyp, either with intravital or with laboratory staining, has a very sharp narrow band of high intensity with a single maximum in the area of 515 m μ c, which is attributable to the dye.

Despite the considerable amount of experimental data on the luminescence of tumors, in none of the above mentioned works has any serious attempt made to explain this phenomenon on a theoretical basis.

According to the data of I. A. Oyvin and V. I. Oyvin (9), a definite part of the fluorescein injected into the body is bound to the albumin of the blood and, with changes in the permeability of vessels, is extravasated together with the albumin into the tissues.

It is possible that the absorption of fluorescein by certain tumors is due to disturbances in the permeability of the vessel walls of vessels supplying these tumors.

CONCLUSIONS

1) Tissues of the ear, nose and throat (both normal and pathologic) absorb fluorescein to differing degrees.

2) A correlation has been discovered between visually observed luminescence upon examination of the ear, nose and throat and the amount of luminescing dye in the tissues.

3) Laboratory staining of pieces of tissue produces the same spectral characteristics as does intravital staining, which also permits studies of the secondary luminescence of tissues under laboratory conditions for the purpose of determining specific dyes for one or another type of pathologically altered tissue.

BIBLIOGRAPHY

1. Gladkova, M. A., Bykova, N. A., Milayeva, M. A., Karyakin, A. V., Vopr. Onkologii (Problems of Oncology), Vol VII, page 41, 1961.
2. Karyakin, A. V., Anisimova, I. N., Biofizika (Biophysics), Vol VII, page 145, 1962.
3. Lushnikov, Ye. S., Gladkova, M. A., Khirurgiya (Surgery), Vol 1, page 86, 1958.
4. Ognev, B. V., Khirurgiya (Surgery), Vol I, page 35, 1958.
5. Cramer, H., Strahlentherapie, Vol 88, page 513, 1952.
6. Moor, G. E., Science, Vol 106, pages 2740-2752, 1947.
7. Moor, G. E., Hunter, S. W., Hubbard, T. B., Ann. Surgery, Vol 130, page 637, 1949.
8. Yefuni, Yu. N., Vestnik Otorinolaringologii, (Herald of Otorinolaringology), Vol 2, page 11, 1961.
9. Oyvin, I. A., Oyvin, V. I., Byull. Eksp. Biol. Med. (Bulletin of Experimental Biology and Medicine), Vol 29, page 366, 1950.